

WHAT IS CLAIMED IS:

1 1. A method of forming a thin silicon oxide layer over a substrate
2 disposed in a substrate processing chamber, said method comprising:
3 introducing tetraethylorthosilane into the processing chamber;
4 purging the tetraethylorthosilane from the processing chamber;
5 introducing ozone into the processing chamber after purging of the
6 tetraethylorthosilane; and
7 purging the ozone from the processing chamber.

1 2. The method of claim 1, further comprising repeating:
2 introduction of tetraethylorthosilane;
3 purging of the tetraethylorthosilane;
4 introduction of the ozone; and
5 purging of the ozone.

1 3. The method of claim 1 further comprising:
2 introducing ozone into the processing chamber prior to introducing the
3 tetraethylorthosilane; and
4 purging the ozone from the processing chamber prior to introducing
5 tetraethylorthosilane.

1 4. The method of claim 1 wherein the thin silicon oxide layer is formed
2 over a silicon nitride mask and over a thermal oxide trench liner.

1 5. The method of claim 1 further comprising performing chemical vapor
2 deposition of silicon oxide on top of the thin silicon oxide layer.

1 6. The method of claim 5 wherein the chemical vapor deposition of
2 silicon oxide is performed by mixing tetraethylorthosilane and ozone in the processing
3 chamber following purging of the ozone.

1 7. The method of claim 5 wherein the chemical vapor deposition of
2 silicon oxide is performed in a different processing chamber.

1 8. The method of claim 1 wherein the tetraethylorthosilane and the ozone
2 are purged from the processing chamber by introduction of an inert gas.

1 9. The method of claim 8 wherein the inert gas is selected from the group
2 consisting of argon, helium, nitrogen, and various mixtures thereof.

1 10. A method of treating a surface to receive chemical vapor deposited
2 silicon oxide, the method comprising:
3 exposing the surface to a silicon-containing precursor gas in a
4 processing chamber;
5 purging the silicon-containing precursor gas from the processing
6 chamber;
7 introducing an oxidant into the processing chamber after purging the
8 silicon-containing precursor gas; and
9 purging the oxidant from the processing chamber, such that a thin layer
10 of oxide is formed over the surface to serve as a basis for subsequent uniform chemical vapor
11 deposition of silicon oxide.

1 11. The method of claim 10 further comprising repeating:
2 introduction of the silicon-containing precursor gas;
3 purging of the silicon-containing precursor gas;
4 introduction of the oxidant; and
5 purging of the oxidant.

1 12. The method of claim 10 further comprising:
2 introducing the oxidant into the processing chamber prior to introduction of
3 the silicon-containing precursor gas; and
4 purging the oxidant from the processing chamber prior to introduction of the
5 silicon-containing precursor gas.

1 13. The method of claim 10 wherein the surface comprises a silicon nitride
2 mask layer and a thermally-grown oxide trench liner layer.

1 14. The method of claim 10 further comprising performing chemical vapor
2 deposition of silicon oxide over the thin oxide layer.

1 15. The method of claim 14 wherein performing chemical vapor
2 deposition of silicon oxide comprises mixing the silicon-containing precursor gas and the
3 oxidant in the processing chamber following the oxidant purge step.

1 16. The method of claim 14 further comprising:
2 transferring the surface to a different processing chamber; and
3 performing chemical vapor deposition of silicon oxide in the different
4 processing chamber.

1 17. The method of claim 10 wherein the silicon-containing precursor gas
2 comprises tetraethylorthosilane (TEOS) and the oxidant comprises ozone.

1 18. The method of claim 10 wherein the silicon-containing precursor gas
2 comprises SiCl_4 and the oxidant comprises steam (H_2O).

1 19. The method of claim 10 wherein the silicon-containing precursor gas
2 comprises $\text{Si}(\text{NCO})_4$ and the oxidant comprises steam (H_2O).

1 20. The method of claim 10 wherein the silicon-containing precursor gas
2 comprises $\text{CH}_3\text{OSi}(\text{NCO})_3$ and the oxidant comprises hydrogen peroxide (H_2O_2).

1 21. The method of claim 10 wherein the silicon-containing precursor gas
2 and the oxidant are purged from the processing chamber by introduction of an inert gas.

1 22. The method of claim 21 wherein the inert gas is selected from the
2 group consisting of argon, helium, nitrogen, and mixtures thereof.

1 23. A method of forming a shallow trench isolation structure on a silicon
2 substrate having a plurality of trenches etched therein to define isolation regions and a
3 plurality of masked regions on an upper surface of said substrate positioned between said
4 isolation regions, said method comprising:
5 exposing the substrate to an oxidizing ambient to create a thermal oxide layer
6 within the trench;
7 forming a layer of silicon oxide over the thermal oxide layer by alternating
8 (i) introducing to the chamber a first gas consisting of one of a silicon-
9 containing precursor gas and an oxidant,

(ii) purging the first gas from the chamber,
(iii) introducing to the chamber a second gas consisting of the other of the silicon-containing precursor gas and the oxidant,
(iv) purging the second gas from the chamber, and
(v) repeating steps (i) - (iv) until a desired thickness of the silicon oxide layer is achieved; and
filling the trenches with chemical vapor deposited silicon oxide material.

1 24. The method of claim 23 wherein the silicon-containing precursor gas
2 comprises tetraethylorthosilane (TEOS) and the oxidant comprises ozone.

3 25. The method of claim 23 wherein the silicon-containing precursor gas
4 comprises SiCl_4 and the oxidant comprises steam (H_2O).

5 26. The method of claim 23 wherein the silicon-containing precursor gas
6 comprises $\text{Si}(\text{NCO})_4$ and the oxidant comprises steam (H_2O).

7 27. The method of claim 23 wherein the silicon-containing precursor gas
8 comprises $\text{CH}_3\text{OSi}(\text{NCO})_4$ and the oxidant comprises hydrogen peroxide (H_2O_2).